The

Production of Cheaper and Better Forage Crops for Live Stock in Central Alberta

By

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Eighty acres of mixed hay gave a yield of 240 tons in 1926 and slightly over 200 tons in 1927 and 1928. These high yields are the result of using proven varieties of grasses and legumes in the right combination on land fertilized with barnyard manure.

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INTRODUCTION

The problem of finding suitable pasture and winter feed for live stock is of increasing importance to farmers as well as ranchers who are producing beef on grass, i.e., during the summer months only. The live stock producer in many cases is at a disadvantage in that little provision is made for winter feed. Under such conditions, there tends to be many unfinished cattle on the market in the fall and an increasing demand for stocker cattle in the spring with the result that unfinished cattle sell cheaply in the fall and command a relatively high price in the spring. The natural result of such a condition is that there is little profit in the cattle business. The production of suitable feeds for live stock would reduce the cost of production and result in the more orderly marketing of better finished cattle at comparatively higher prices which, in turn, would net the grower greater profits and returns per animal and per acre.

Free range is a thing of the past! The grass cattle which find their way to the markets are not the equal of the big finished steers of the days of open range. The explanation is not difficult. In the old days of unlimited range, there was an abundance of forage and cattle selected their diet and grew accordingly. With the ranges fenced and frequently overgrazed, the stock produced is representative of the pasture and forage on which it is produced and is of inferior quality. Cattle are of necessity frequently marketed while they are both under age and underfinished.

Many of our most prominent stockmen and our best breeders have spent large sums of money importing high priced breeding stock to maintain quality in their herds and flocks. In many cases they found that their stock decreased in size and quality so quickly that new blood was needed every few generations to maintain a standard considerably lower than that of the stock imported. Had these same stockmen utilized a portion of this money and effort in the improvement of their pastures and winter feeds, they would have met with greater success. Live stock of size and quality cannot be produced unless an abundance of a properly balanced ration is available in the form of pasture and winter feed throughout the entire period of development of the animal. That the West can produce feeds and live stock second to none in the world has been amply demonstrated on innumerable occasions at the principal fairs and exhibitions throughout the continent.

The need for and the factors involved in diversified farming are appreciated by most farmers. The general adoption of diversified farming, however, is being retarded by the fact that farmers living in the park belt where wheat on summer-fallow usually yields from 30 to 50 bushels per acre have to be shown how to produce forage crops which, when marketed by the live stock route, will bring in as great a return per acre.

General opinion attributes the trend of grain prices toward lower levels to overproduction resulting from the introduction of power machinery and, in a large measure, to the combine harvester thresher. It is doubtful, however, if the combine will ever come into general use in the park belt for the reason that the topography of the land and the climate of the district do not lend themselves to

the use of this implement; and, since combined grain can be produced much more cheaply than that which of necessity must be cut with a binder, it would seem that the park belt of the prairie will ultimately be forced out of exclusive grain growing by the more cheaply produced combine grain of the open prairie. The park belt, on the other hand, because of its greater precipitation and natural adaption to forage crop and live stock production, appears to be the logical part of the prairie where diversified farming should be practised. Providing suitable forage crops are grown there appears to be no reason why the park belt should not be able to compete with the world in the production of live stock.

Mixed farming is generally considered essential to success in regions where crop failures due to frost, drought, etc., come frequently, and sometimes successively for two or three years. The amount of risk with a one crop system of farming in such districts makes a certain amount of live stock necessary to provide a respectable living for the farmer and his family.

Experience indicates that, even in our more favoured districts, if wheat or any of the other cereals are grown continuously on the same land for a number of years, their production will eventually become unprofitable as a result of the inroads of weeds, plant diseases and soil troubles. On such land, farmers instinctively turn to mixed farming with diversified crops grown in rotation. Rotations which include forage crops that add root fibre to the soil and act as cleaning crops, will maintain soil fertility for a longer period and ultimately prove more profitable under most conditions than exclusive grain growing. The enemies of field crops increase as the agriculture of a district grows older. The damage done by insects, plant diseases and weeds is enormous. While these factors in crop production cannot be brought under complete control by the use of forage crops, nevertheless their judicious use will do much to curtail the damage originating in these sources.

In many instances, farmers are working at a disadvantage in live stock production in that there is an abundance of low grade cheap fodder available in the form of straw, wild hay and oat green feed, but high priced protein feeds must be purchased if a balanced ration is provided. What is wanted in such cases is not more coarse fodder but more digestible material—protein, carbohydrates and fat. Not more quantity but quality. The question is how to get this most conveniently and economically.

The suggestions made in the following paragraphs are founded on cultural and rotation experiments and variety and strain tests with forage crops reported in detail in the annual reports of the Station; they summarize observations made in practical forage crop production at the Lacombe Experimental Station, during the ten year period, 1921-1930.

The Experimental Station maintains herds of live stock much in excess of those found on the average live stock breeding establishment, hence the question of feed is so vital that any variety, or forage crop treatment which looks promising in the experimental plots is immediately given the acid test of actual production under field conditions. Observations indicate that the production of the best varieties of suitable forage crops in the proper way has increased the stock carrying capacity of the land at the Experimental Station greatly in excess of that found on the average farm. Since increasing the carrying capacity of the land can only be acomplished by increasing the quality and quantity of forage crops produced per acre and, since this would seem to be the logical way to reduce cost of production, the experience of the past ten years in practical forage crop production is given herewith. The reader should bear in mind, however, that the suggestions apply in general to the park belt of the prairie where the annual precipitation is more liberal than that which usually prevails on the open prairie.

PASTURE CROPS

Good pasture should be provided if the most economical results are to be obtained in live stock production. The importance of pasture crops and their management will be appreciated when we realize that our live stock are maintained on pasture from six to eight months of the year and, unfortunately, many of them for longer periods. The gains made on pasture during the normal pasture season are usually much cheaper and more rapid than those made in the feed lot; hence any forage crop improvement program is not complete which does not take pasture crops into consideration.

Good pasture will carry live stock of all kinds over the summer period at a minimum cost and in a vigorous and thriving condition. It is the common experience of stockmen that good pasture is the best feeding stuff for live stock. The resemblance between the mineral and protein content of good pasture and that of cow's milk (the food of ideal composition for growing animals) is fairly close and corresponds closely to the mineral requirements of the animal. These factors determine the high nutritive value of pasture for promoting growth and maintaining health in live stock. The fact that the average farm animal spends at least one half its life in the pasture field during which it is nourished by the forage on which it grazes, coupled with the fact that good pasture is the best feeding stuff for live stock, would indicate that pasture is one of our most important forage crops.

Pasture crops may be divided into three classes: annual, biennial and perennial.

ANNUAL PASTURES

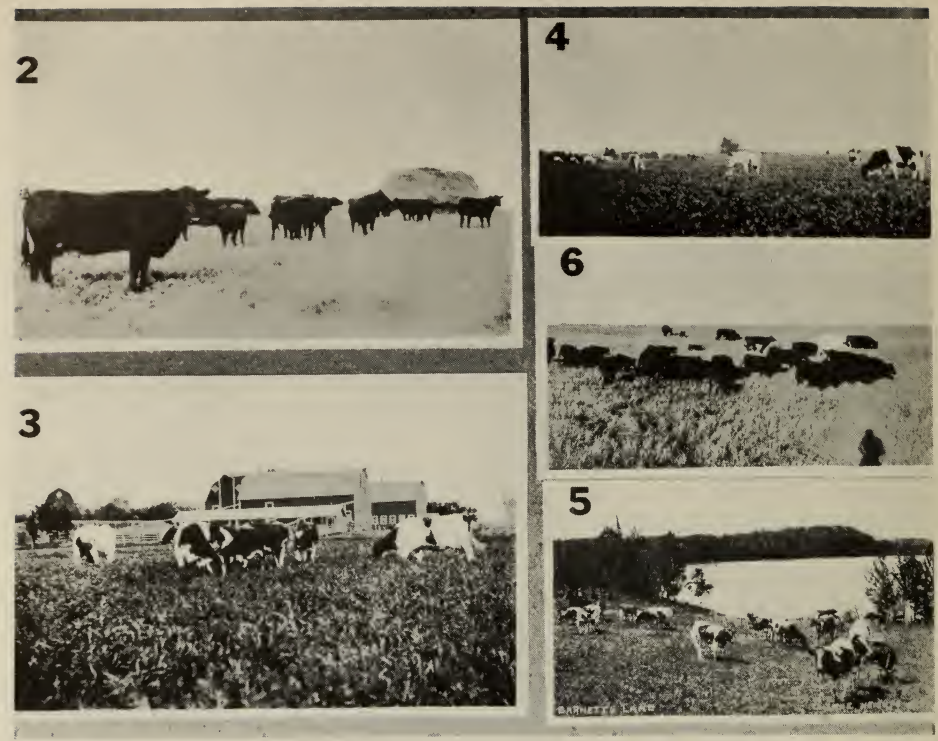
Annual pastures are those which are grazed the same year in which they are seeded and consist of plants which live for one season only.

Cereals.—All the cereals may be used either alone or in combination for annual pasture. The Lacombe Experimental Station has had excellent results with a combination of two bushels of oats and one bushel of winter rye per acre as a catch crop for pasture. This combination has given excellent results when used for cattle, horses, hogs and poultry. This pasture may be seeded as early in the spring as the land is fit to work. It will provide pasture as soon as the oats are five or six inches high and will continue to make a new fresh growth until the land freezes up in the fall. The oats provide the pasture during the first half of the season and the winter rye provides the late summer and fall pasture. If not pastured too closely some of the oats will head out and mature seed and some of the winter rye will send up a few scattered heads. When handled in this way, this mixture has provided excellent shade and pasture for poultry and young pigs. Any grain which matures is not wasted as it is relished by the stock pasturing on the field. For this reason it is always wise to seed a larger area than is actually needed for the number of animals to be pastured.

The winter rye in the mixture, providing it is not grazed closely too late in the fall and winter-kills, will make an early growth the following spring and may be used for early spring pasture, rye green feed or hay, or, it may be allowed to ripen for grain.

The oats and rye are usually mixed before being placed in the seed drill. If used for patching up or improving a thin or patchy new seeding, it is better to disk the land before seeding and add some grass or clover to the mixture which is usually seeded on spring plough stubble.

This annual pasture may be converted into a permanent pasture by adding to the oat and rye mixture any of the grass and legume mixtures recommended in later paragraphs.



No. 2—Herd of Aberdeen-Angus cattle converting autumn growth on Western rye grass and timothy meadow into beef. Such returns are lost without live stock.

No. 3—R.O.P. Holstein cows grazing on a luxuriant growth of oats and winter rye annual pasture.

No. 4—Holstein herd on sweet clover-western rye grass-timothy pasture. Forty acres of this pasture carried approximately seventy-five head of cattle throughout the pasture season of 1926.

No. 5—Holstein herd of Canadian Junior College, Lacombe, on wild land pasture. Note abundance of water and shade, typical of the park belt of Alberta.

No. 6—The Experimental Station herd gleaning the stubble and converting into beef roughage usually ploughed under on a grain farm.

Rape.—Rape is an excellent annual pasture for hogs and sheep. Four to five pounds of seed per acre is sufficient for seeding in drills 30 inches apart while about eight to ten pounds are necessary if the seed is drilled or broadcast the same as an ordinary grain crop. That grown at the Experimental Station is usually drilled in like an ordinary grain crop early in May on spring ploughing.

Rape is used extensively for poultry pasture but has one disadvantage for this purpose in that it is liable to taint the eggs.

Rape has been used as a summer-fallow substitute in districts where the summer-fallow is apt to give a crop which lodges badly. When used for this purpose it is generally utilized as fall pasture for flushing ewes or finishing lambs or beef cattle. Remarkable gains have been made in finishing lambs on this pasture while the succeeding crop of grain compared favourably with that produced on summer-fallowed land handled in the usual way. There is no doubt that rape might be used to advantage on many of the farms of the park belt and tend to reduce the cost of raising live stock.

BIENNIAL PASTURES

Biennial pastures are those which consist of plants which require two years to complete their life cycle.

Winter Rye.—Winter rye is our most common biennial pasture. In actual practice, it is usually seeded on summer-fallow early in the summer, about July 1 to August 1, and pastured during the late summer and fall and again early in the spring, after which it is allowed to mature for greenfeed or grain.

All classes of live stock appear to relish winter rye in the fall and early spring but it quickly loses its palatability when it attains the shot blade stage of maturity. Since the crop ordinarily comes in head during the latter part of May it is usually more profitable to keep the field pastured closely in the spring and plough it up about the first week in June and re-seed to some other crop such as oat greenfeed, barley or the oat rye mixture if more pasture is needed.

Sweet Clover.—Sweet clover is coming into more general use as a pasture crop. When sown for this purpose, it is usually seeded with a cereal nurse crop of wheat, barley, or an early maturing variety of oats and pastured during the succeeding year. In the drier districts, the sweet clover seed is usually mixed with that of the nurse crop and drilled. In the more moist districts, however, it is frequently broadcast from the grass seeding attachment of the grain drill. Sweet clover is used in different combinations for perennial hay and pasture crops.

Mixtures.—Mixtures frequently make more satisfactory pastures for certain conditions than any one crop alone. Possibly one of the best mixtures one could use if pasture is needed for two years only would be two bushels of oats, one bushel of winter rye and twelve to fifteen pounds of sweet clover per acre. This mixture could be still further improved by adding either or both rye grass and timothy. If one grass only is used the amounts recommended are eight pounds rye grass or four pounds timothy. If both kinds of grass are added, one half the quantity recommended for each would be sufficient. The complete mixture would therefore be:—

Winter rye	1 bushel
Oats	2 bushels
Sweet clover	10-15 pounds
Western rye grass	4 pounds
Timothy	2 pounds

This combination will form a luscious pasture from a few weeks after it is seeded until the end of the second year. In the interests of good farming it would be wise to plough this land at the end of the second year as the soil would have received full benefit from the grass and legumes at the end of this period. Certain conditions may arise in which the grower might wish to leave this land another year for hay or pasture. The third year's crop in this case would consist of grass only. The third year's crop of hay or pasture is usually surprisingly heavy. The residual effects of the decaying sweet clover roots in the form of nitrates and humus promote a rank, heavy growth in the succeeding grass crop. These benefits, as a rule, are largely exhausted with one crop, hence it is unwise to leave a meadow seeded down with this mixture for more than three years.

No. 7—Advanced Registry Berkshire gilts on brome grass pasture. Brome makes an excellent hog pasture if not allowed to get too far ahead of the hogs.

No. 8—Rape ready for grazing.

No. 9—A portion of the herd of 60 brood sows maintained at the Experimental Station, Lacombe, Alta., grazing on oat-winter rye annual pasture. These sows have not had any grain for nearly two months.

No. 10—An ideal live stock country; trees and low brush interspaced with open glades typical of the park belt.

No. 11—Brood sows on oat-winter rye annual pasture. The trees fringe a small lake. These sows receive no grain after weaning their litters. Nature provides water, feed and shelter.

No. 12—Yorkshire sow with part of her litter in the oat-winter rye annual pasture showing a portion which has not been grazed closely. Note the protection and shade provided for the young pigs.

No. 13—Flock of sheep cleaning up the roads and fence lines and converting a weed menace into mutton and wool at the Experimental Station, Lacombe.

PERENNIAL OR PERMANENT PASTURES

Perennial pastures are those that last for three or more years.

Brome Grass.—Brome grass has proven to be one of our most dependable permanent pastures for horses, cattle and swine. It makes an early growth in the spring and continues until late fall. It is much better for pasture than for hay purposes as it tends to develop a thick, matted growth of leaves near the ground when the sod becomes dense or "sod bound". It will give a greater growth in a dry year than any other single grass.

Brome grass is relished by all classes of live stock. It appears to thrive best if kept closely grazed when it will continue to send up fresh new growth. It is a grass which responds readily to fertilization, hence the carrying capacity may be materially increased by an application of well rotted barnyard manure. This should be applied with a spreader in the fall and winter and harrowed in the spring.

Blue Grass.—The possibilities of blue grass as a pasture crop for the park belt have never been appreciated. It will make an abundant growth of very nutritious feed in a year with a reasonable amount of moisture available but falls down badly in productiveness under very dry conditions. It is stimulated into making a strong growth by fall rains following a dry summer.

The leaves and stem of the blue grass are very fine and give it the appearance of producing a very low yield per acre. This impression is misleading as it produces nearly as much dry matter per acre as other grasses providing there is a reasonable amount of moisture available. This grass can be used to best advantage, however, in a pasture mixture. Three or four pounds of blue grass seed per acre will greatly improve the quality of the feed produced on most pastures.

Alfalfa.—Alfalfa is seldom used for pasture for cattle, horses or sheep in the park belt for the reason that the area actually under this crop is very limited and those who have the crop growing find they can utilize it to better advantage as hay than as pasture. It is used to some extent and is one of the best pastures available for poultry and hogs. Those who use alfalfa for hog pasture frequently allow it to become overgrazed with the result that the hogs root it out and eat the young tender roots thus spoiling the stand. For this reason hogs pasturing on alfalfa should not be confined on too small an area; neither should they be allowed on the field before the new growth starts in the spring at which time they show the greatest tendency to root out the plants. Poultry pasturing on alfalfa eat the plants down closely in patches as they prefer the fresh, new growth. Since they tend to eat down those portions nearest their drinking fountains and self feeders, these should be moved at sufficiently frequent intervals to prevent the poultry destroying the stand.

Pasture Mixtures.—A mixture of different grasses and legumes is usually more satisfactory than any one crop seeded alone.

The cereal mixture of two bushels of oats and one bushel of winter rye per acre can be converted into a permanent pasture by adding any of the following:—

(*a*) 10-15 pounds brome grass.
(*b*) 10 pounds brome grass.
10 pounds sweet clover.
(*c*) 8 pounds rye grass.
2 pounds timothy.
10 pounds sweet clover.
(*d*) 5 pounds timothy.
4 pounds Altaswede red clover.
2 pounds alsike.
2 pounds White Dutch clover.

The above mixtures may be seeded with any cereal crop as well as the cereal mixture referred to, and would be improved by the further addition of a few pounds of blue grass per acre.

The Brome mixtures (*a*) and (*b*) are recommended for use on land that is to be left permanently in sod, while the rye grass mixture (*c*) is reccommended for high land which is intended for pasture for a few years only. The timothy-clover mixture (*d*) is recommended for locations where there is plenty of moisture available such as a drained slough or muskeg.

The writer does not wish to leave the impression that the pasture crops referred to are the only crops or combinations of crops which should be used. Those referred to are those which have been under observation under field conditions at the Experimental Station, Lacombe. There doubtless are other crops and combinations which may ultimately prove superior to the ones mentioned.

HAY CROPS

The first lands taken up by settlers in the park belt of the prairie were the wild hay meadows. They have been cut consistently ever since. While most of them are standing up remarkably well, the hay produced is wholly inadequate, both in yield and quality, for the needs of the country. In many cases they border lakes or sloughs or are irrigated by surface drainage from higher land and as a result, give a fair yield of low grade hay. Upland hay or "prairie wool" is a thing of the past in most districts and is so low in yield and so uneconomical to produce that those who still have land producing this crop might well consider utilizing it for other purposes. While it is true that excellent live stock by the trainload have been pastured on native grass and wintered on wild hay, nevertheless the fact remains that much of this land might now be used to much better advantage were it seeded with tame grasses and legumes.

The use of land for the production of hay continuously from meadows of grass is a doubtful economic practice except on land not suited to the production of other crops. Land sufficiently level and dry for cultivation should not be left in permanent grass hay. Cost of production data covering several years hay crops grown continuously on the same land indicate that alfalfa is the only hay crop that will pay dividends if the land is left in hay permanently. There appears to be a certain period beyond which it is economically unwise to leave a meadow. This will be referred to in discussing the different hay crops.

METHODS OF SEEDING GRASSES AND LEGUMES

Experiments and experience indicate that there are certain years with an abundance of moisture when it is very easy to get a good catch of seeding of both grasses and legumes, and that there are certain dry seasons when conditions are such that it is almost impossible to secure a good stand of either grasses or legumes even when the most approved methods are applied. Many farmers have been unable to secure good stands and it is surprising the number who give up trying after one or two failures. It would seem that the question of getting a stand of grass and clover is one of the greatest stumbling blocks in forage crop production.

At the Experimental Station, Lacombe, grasses and legumes are usually seeded in the spring with a nurse crop of barley, or an early maturing variety of wheat or oats on land which was in summer-fallow or produced an intertilled crop the previous year. When the "seeding down" is done in this way it is very seldom that a good "catch" is not secured in years of normal rainfall. Seeds such as Brome or Western rye grass are mixed with the seed of the cereal used as a nurse crop and drilled; the smaller seeds of clover, timothy, alfalfa, etc., are broadcast from the grass seeder attachment of the drill.

The fine seeds of grass and legumes require a firm soil that is fine in tilth and moist. They are very small in size and if seeded too deeply will produce plants which either lack vigour when they emerge above the ground or are completely smothered. The soil should be firm so that the moisture will be near the surface to facilitate the germination of the small seeds before the nurse crop becomes sufficiently well established to smother the small seedlings. Thorough packing after seeding will facilitate germination and pay handsome dividends.

It is often very difficult to get a good catch on spring ploughing which is seeded at once. If the season is dry there is not sufficient moisture near the surface to germinate the seed. Under such conditions packing merely pulverizes the soil and apparently does not raise the subsoil moisture to the surface. A good soaking rain is the only solution for such a problem. If it is the intention to seed down a piece of spring ploughing which tends to be rather dry, it is a good plan to let it lie for a week or ten days or until a good rain comes to settle the soil and fill the furrow slice with moisture.

Occasionally conditions arise over which the grower has no control such as cutworms destroying all the tender young seedlings and leaving the harder plants of the nurse crop, or serious soil drifting, or very dry weather, or winter-killing may thin out the stand. The practice followed at the Lacombe Station is to patch up thin places by disking the land sufficiently to form a fine soil mulch about one to one and a half inches deep and drill in sufficient additional seed to make a good stand with about two bushels of oats. In this case the seed drill is so adjusted that the grass and clover seed is drilled into the ground along with the oats. The firm subsoil prevents the drill from sowing the seed too deeply. The land is then thoroughly packed and the seed comes up very quickly. This method may be used either in the summer for repairing cutworm damage, etc., or in the spring for thickening up winter-killed areas. This method also has great possibilities in establishing new stands on old stubble fields where for any reason it would be unwise to spring plough and where a sacrifice of the crop of oats will not work a hardship, as the method involves cutting the oats as soon as they are in head. This method of renewing a thin stand or establishing a new one has, even in the driest years, always proven successful.

Experience indicates that it is wise to sow alfalfa without a nurse crop. While this means the loss of one season's crop it should be borne in mind that a good stand is one of the most essential factors in the production of this crop. Best results in securing a stand have been obtained when the land has been cultivated early in the spring, ploughed in May, kept well cultivated and harrowed until about the 20th of June when the seed is drilled at the rate of 12 to 15 pounds per acre. The first year's growth should not be clipped back too close or pastured, but allowed to go into the winter with a good top. A stand of alfalfa developed in this way will provide high yields for several years with very little attention.

LEGUMES

Alfalfa.—Alfalfa is the best and most dependable legume hay crop for Central Alberta. It starts growing early in the spring and continues throughout the summer and into the late autumn. It does not winter-kill if an acclimatized strain is grown and will produce a heavy tonnage of highly nutritious feed that is relished by all classes of stock. It outyields all other hay crops. The fact that it is very deep rooted makes it possible for it to produce a heavy tonnage in a very dry year when other crops are almost a complete failure. It has proven so hardy that it is necessary to backset the sod to eradicate it. The writer has no hesitation in recommending alfalfa above all other legumes or grasses providing suitable seed is sown in the proper way.

Alfalfa should be seeded on an area which can be left undisturbed for a few years, hence does not fit in well on the average farm rotation. It should be left

No. 14—Relative growth of brome (on the left) and timothy (on the right) in a dry season.

No. 15—Relative growth of timothy (on the left) and western rye grass (on the right) in a dry season. Timothy will outyield the western rye in a wet year.

No. 16—Cutting a three-ton crop of a mixture of sweet clover-western rye grass and timothy.

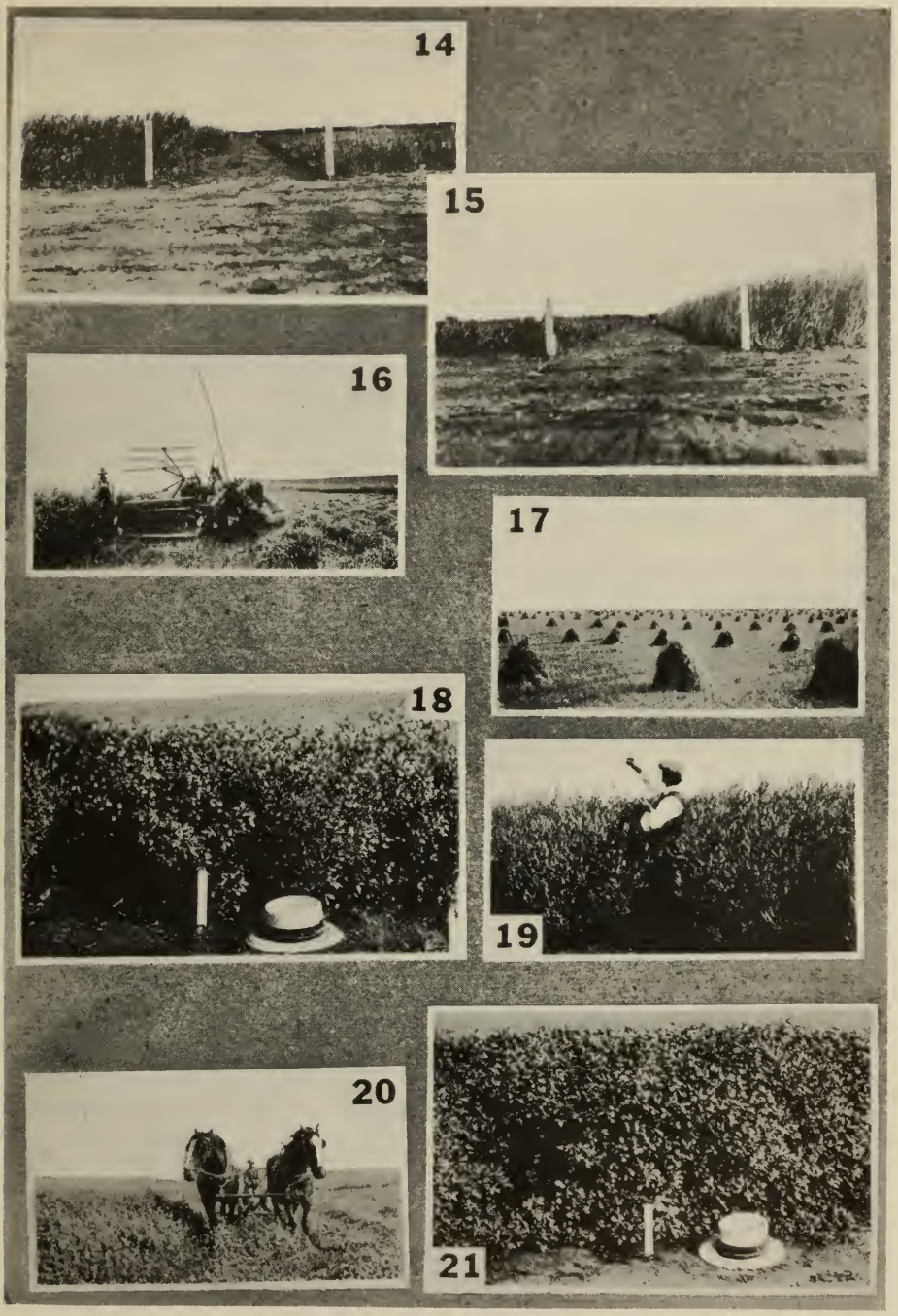
No. 17—A crop of sweet clover, western rye and timothy in the stook. Had this field been seeded with sweet clover alone it would have been necessary to plough it up as the sweet clover thinned out badly during the winter. Inclusion of the grasses made it possible to harvest a one-and-a-half ton crop of excellent feed.

No. 18—Alfalfa seeded June 25 and photographed September 1. This crop was drilled on spring ploughed and partially summer-fallowed land without a nurse crop.

No. 19—A crop of sweet clover seed. Everyone should grow their own seed. It can be cut with a binder and threshed with a grain separator.

No. 20—Cutting a three-and-a-half-ton crop of a mixture of red clover, timothy and alsike clover. This crop does well in a wet year but winter kills badly following dry seasons.

No. 21—Sweet clover handled in the same way as the alfalfa shown in No. 18. If seeded a few weeks earlier the sweet clover makes an excellent annual hay crop.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unbroken for several years to get the full benefits from the crop. It tends to improve for three or four years, and requires approximately the same length of time to deteriorate sufficiently to necessitate breaking up.

The yields of hay produced by a good stand of alfalfa vary from about two tons per acre in a dry year to over three tons per acre in a year with an abundant rainfall. Be sure to try a few acres of this crop grown from seed produced in the Prairie Provinces.

Sweet Clover.—Sweet clover was considered one of our noxious weeds but now is the most extensively grown legume on the prairies. Sweet clover has several features which make it particularly suitable for the type of farming practised in the West. It fits in exceptionally well in a short rotation as practised on the average farm. It can be seeded, harvested and threshed with the machinery already available on the ordinary grain farm. It produces an abundance of seed which is high enough in price to make its production profitable, and low enough in price to make it readily available to everyone. In addition to being an excellent fodder crop, it is also an excellent cleaning crop and soil improver.

The Experimental Station, Lacombe, has been sowing several hundred pounds of seed per year for a number of years and has found that sweet clover will give a heavy yield of excellent feed where the stand is not thinned out by winter-killing or one of the severe root-rot diseases which affect this crop during the late fall and early spring. While the general practice over the greater part of the prairie is to sow sweet clover without an admixture of other grasses or legumes, experience has shown that, because of the tendency of sweet clover to thin out during the winter, it is wise to sow it in a mixture with other grasses, further details of which are given in the section on grass and legume mixtures.

Alsike Clover.—Alsike clover has never been used extensively as a hay crop. It appears to be quite winter hardy but is seldom seeded alone as it gives better results when combined with a grass that will hold it up such as timothy. It thrives best where there is an abundant supply of moisture available. It would seem that this clover might well be used more extensively in the foothill country where soil and moisture conditions favour its production.

Red Clover.—Red clover is of doubtful value as it appears to lack both winter hardiness and productiveness in seasons and districts with a limited rainfall. It gives very heavy yields of excellent hay where it does not winter-kill and appears to be well suited to the clay, bush soils of the bush country. The single cut or mammoth types, of which the Altaswede is one of the best varieties, appear to be better suited to the needs of the country than the common or double cut clovers. Under favourable conditions red clovers will give several successive crops of hay without reseeding. Red clover does best if combined with a grass such as timothy.

GRASSES

Brome.—Brome appears to remain productive longer than any other single-grass. It can be depended upon to give fair yields for about four years after which it is doubtful if it is wise to leave it for hay production. Because of its creeping root stalks it is doubtful if it is wise to use it for hay production except on high, dry land too rough for cultivation where it can be left more or less permanently. It is more suitable than timothy or Western rye for such conditions.

Brome is rather slow in establishing itself and for that reason is often sown in a mixture with other grasses or legumes, the most common of which is equal parts of brome and sweet clover.

Brome grass can be rejuvenated by ploughing the sod five or six inches deep immediately after cutting and summerfallowing for the balance of the season. If one crop of grain is taken, there usually is sufficient brome left in the soil to make an excellent meadow the following year. If a grain crop is not wanted, the land is merely worked down after ploughing and left undisturbed and the brome grass will re-establish itself more vigorously than ever.

Western Rye.—Western rye is the most dependable and satisfactory grass for hay used at the Lacombe Station. It should form the base of all hay mixtures. It gives surprisingly heavy yields but produces a dry, wiry hay that is not relished by live stock when grown alone. It appears to retain its heavy yielding capacity and loses its unattractiveness as a hay when grown with other grasses and legumes. In fact, its lack of leaf, etc., appear to make it a particularly suitable grass to grow in combination with sweet clover.

Many farmers are afraid to use Western rye grass because of the possibility of purchasing quack grass infested seed. This difficulty may be easily overcome by purchasing "Certified Seed", which is field inspected and certified free from quack grass by officers of the Dominion Seed Branch. As a rule, "Certified Seed" sells for a very small premium over commercial stock and is well worth the difference in price.

It is seldom wise to grow rye grass alone for hay because it is more or less unattractive to live stock. It is quite satisfactory however, when used in one of the mixtures which will be discussed later.

The drought resistant qualities of Western rye grass were demonstrated in 1924, a year in which there was practically no precipitation during the growing season. Under these conditions timothy did not produce sufficient hay to justify running the mower over the land, while Western rye grass produced over one ton of hay per acre.

Western rye grass sod does not have the same tendency to become sod bound that timothy has and works down nearly as easily as stubble; it appears to leave considerable root fibre in the soil, and it also leaves the soil in excellent tilth.

Timothy.—Timothy does not appear to do well in many districts for the reason that it is a moisture loving plant and there usually is insufficient moisture for the proper development of the crop. It undoubtedly is our best grass for wet seasons and low, moist locations, hence all hay mixtures for the park belt should contain a sprinkling of timothy seed. There are but few locations or conditions where seeding pure timothy is justified unless it is grown for a special market. Locations which are suitable for the production of timothy are usually suitable for red and alsike clover, hence such land should be seeded with a mixture of these three crops. A mixture of 4 pounds timothy, 4 pounds red clover (Altaswede), and 2 pounds alsike clover have given yields of over three tons per acre of excellent hay in years with an abundant rainfall. Unfortunately, however, this mixture falls down badly in dry seasons when the clovers usually winter-kill and the timothy yields less than a ton per acre.

Blue Grass.—Blue grass is seldom grown for hay but if used for this purpose will give surprisingly large yields of hay of very fine quality. The yield, at best, however, is considerably below that of rye grass and brome.

Red Top.—Red Top is a native grass which grows in low, moist locations such as around the borders of sloughs, etc. It is doubtful if this grass can be improved on for such locations although the inclusion of timothy and alsike clover should add to the palatability and quality of the hay produced.

Reed Canary Grass.—This grass has not been tested extensively at the Lacombe Station. It may be found growing wild in low, moist locations. It has given exceptionally heavy yields in many districts and since it grows in its wild state throughout the province it should be winter hardy. It would seem that this grass is well worthy of a trial on many of our farms.

GRASS AND LEGUME MIXTURES

Brome and Sweet Clover.—This mixture is usually seeded at the rate of 10 pounds of each per acre and may be used to advantage wherever one would use brome alone. This mixture has an advantage over pure brome in that the sweet clover tends to improve the fertility and tilth of the soil, increase the yield of hay per acre, and retard the sod bound effect which develops in the brome sod. It has a further advantage in that the sweet clover persists for one year only, the year in which brome, because of its inherently slow development, tends to produce a weedy crop if used alone for hay.

The brome-sweet clover mixture has the same disadvantages as brome in that it is difficult to eradicate when once well established, hence should only be used where it is the intention to leave the land permanently in sod.

Rye Grass, Timothy and Sweet Clover.—A mixture of eight pounds of rye grass, two pounds of timothy and ten pounds of sweet clover per acre has been used extensively as a hay and pasture crop at the Lacombe Station. It will produce enormous yields in a season when the sweet clover does not winter kill, and gives a fair yield under unfavourable conditions.

This mixture is an excellent one for mixed farming where it is the intention to leave the land in sod for two, or at most, three years. The first year's crop of hay consists of rye grass, timothy, volunteer grain and sweet clover with sweet clover predominating; the second and third year's hay consists of a mixture of rye grass and timothy. The first year, providing the sweet clover does not winter-kill, gives a yield which is usually well over three tons per acre. The decaying sweet clover roots appear to fertilize the second year hay crop which gives about a fifty per cent heavier crop than the same grasses would if grown without the legume. The third year's crop is considerably reduced and tends to show the sod bound effect typical of old meadows. The use of sweet clover in this mixture appears to delay the development of the sod bound effect one year.

The first year's hay crop of mixed sweet clover and grass may be harvested with a binder, stooked and stacked like an ordinary green feed crop.

The growing of sweet clover, rye grass and timothy in combination has several advantages. The sweet clover has a tendency to thin out during the winter with the result that, if grown alone, a thin, coarse and weedy crop develops. The grasses growing with the sweet clover prevent the development of weeds, cause the sweet clover to develop a shorter and finer stemmed plant which is more easily harvested and cured as hay, and produces a crop which is more acceptable as feed for live stock. The mixture of grasses and legumes constitute a hay which provides a better balanced ration and is consumed with greater relish by live stock than either grasses or legume grown alone.

Western Rye Grass and Alfalfa.—A mixture of ten pounds each of Western rye grass and Grimm alfalfa has proven one of the best hay mixtures tested at Lacombe Station. It is recommended for locations where the water does not stand on the land, and where it is the intention to leave the land in hay for periods greater than two years. Like pure alfalfa, this crop gives the farmer two chances for a hay crop each year which is a decided advantage in districts such as Central Alberta where the summer rains may occur too late in the season

to be utilized by the main hay crop. The first cutting of this hay is a mixture of rye grass and alfalfa while the second cutting each year is pure alfalfa. This mixture will remain productive for several years as it does not become sod bound. The rye grass, being a true bunch grass, does not seriously interfere with the development of the alfalfa plants; while the alfalfa appears to stimulate growth in rye grass. This mixture will produce upwards to three tons per acre in years with an abundant rainfall and around two tons per acre in a dry season. Since a seeding is good for several years, this mixture is considered the best all around and most dependable mixture used at the Lacombe Experimental Station.

Timothy, Red Clover and Alsike.—The mixture of four pounds of timothy, four pounds of Altaswede red clover and four pounds of alsike clover will give yields of over three tons per acre in years with an abundant rainfall. The clovers winter kill badly following dry seasons and the timothy alone is relatively unproductive under such conditions. For these reasons, this mixture can be recommended only for wet seasons or locations, or for districts near the foot hills where the precipitation is relatively higher than that which provails on the open plains.

ANNUAL HAY CROPS

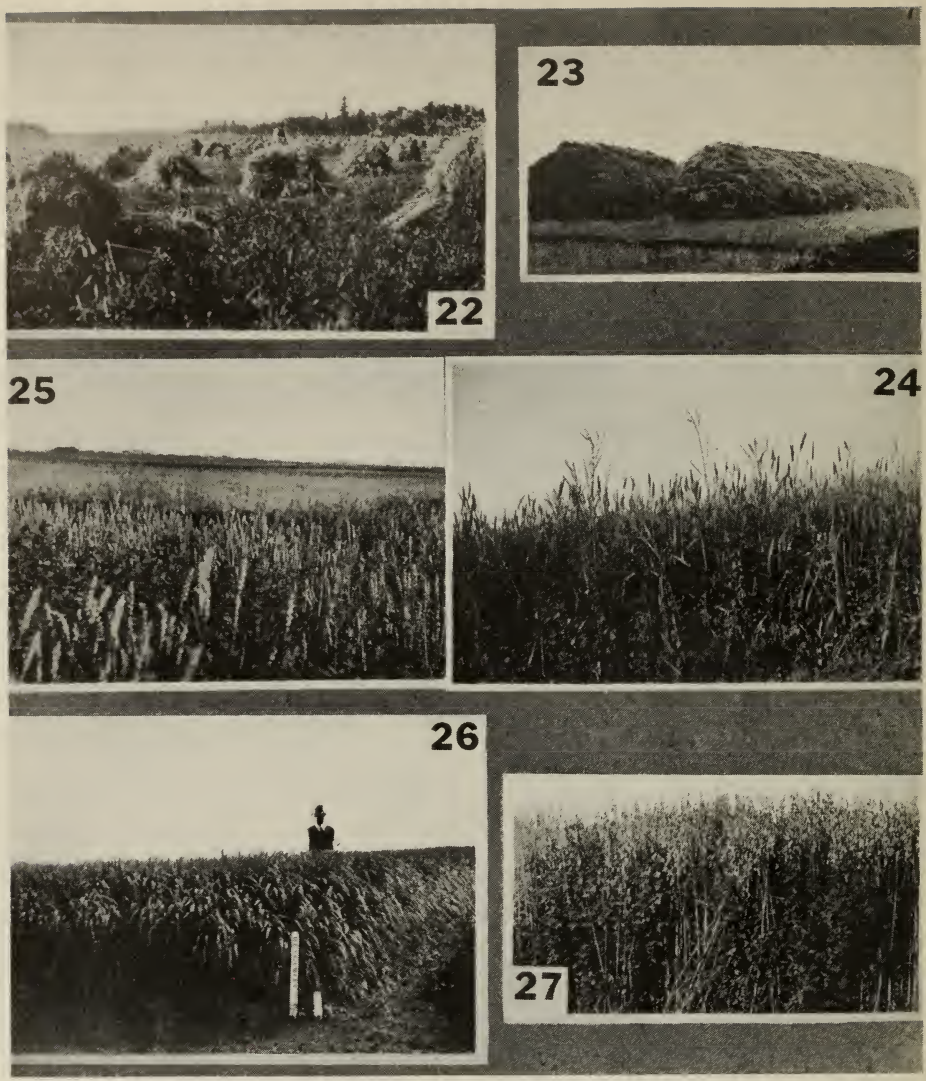
Oat Greenfeed.—Oat greenfeed is grown more extensively in the West than any other forage crop. It is grown so consistently on most farms that very little need be said regarding cultural practices.

Experiments indicate that a one bushel rate of seeding will produce as much tonnage per acre as a four bushel rate of seeding, but the heavier rates of seeding will give a finer stemmed crop that is more palatable and eaten up cleaner than that grown from the thinner seedings.

There appears to be no advantage in leaving this crop uncut after it has attained the firm dough stage of maturity. There is no increase in yield per acre after this stage of maturity has been reached while there is a serious reduction in palatability and feeding value in the straw. Cuttings made from two seasons' crops at two day intervals following the milk stage indicate that there is very little if any increase in the yield of grain per acre following the firm dough stage of maturity, hence farmers who are practising diversified farming might well consider harvesting their oats for grain at this stage of maturity. Harvesting at this stage will give threshed grain with green tips but straw superior in palatability and feeding value to that of fully ripened grain.

Any variety of oats may be used for the production of green feed. Banner and similar varieties will give a very high yield per acre while Alaska and similar, fine strawed, early maturing sorts give green feed superior in palatability and feeding value. The early maturing varieties are very useful for late seeding and combating wild oats and other weeds. Ordinarily the early maturing oats may be seeded as late as June 15, and in exceptional cases as late as July 1 and still mature sufficiently to permit harvesting before being severely injured by early fall frosts. The late seeded crop frequently produces heavier yields per acre than the earlier seedings.

Millets.—The different millets have never proven satisfactory at the Lacombe Station. They are very susceptible to frost injury hence spring seeding must be delayed until the latter part of May or the first week in June in order that the crop may escape spring frosts, while the crop usually is damaged by early fall frosts before it has attained full development. When all things are considered, oat green feed has proven a much more satisfactory crop than the millets.



No. 22—Oat greenfeed in the stook. One of the best and most extensively used fodder crops of the park belt.

No. 23—A winter's supply of oats greenfeed. This crop is one of our best feeds but legumes should be grown to balance the ration.

No. 24—A crop of wheat seeded down with sweet clover in a wet season. Note the sweet clover has grown nearly to the top of the wheat with a few plants extending above.

No. 25—A wheat crop seeded with sweet clover. Showers during the ripening season stimulated growth in the sweet clover until it completely covered the wheat in spots as shown in the dark portions of the picture.

No. 26—A heavy crop of millet just coming in head. This crop is very susceptible to frost injury and is usually damaged by early fall frosts at about this stage of maturity. Green feed is a much safer crop.

No. 27—A crop of oats seeded down with sweet clover in a wet year. Note the sweet clover within a short distance of the top. The oat straw and sweet clover make an excellent food.

Oat Mixtures.—Oats have been grown in combination with peas, tares, millets, etc., but as yet the crop produced by these mixtures does not seem to justify the added expense and trouble involved in producing them. This is a very promising field for experimental work, however, and it is possible that a combination of different varieties of different crops will be found which may prove more satisfactory than any of those tested to date.

SILOS AND SILAGE CROPS

Silage has proven the cheapest and most dependable of the different forage crops produced at the Experimental Station, Lacombe. From three to five hundred tons of silage are produced each year. Experience has shown that it is advisable to grow more than one silage crop. Seasons differ. A year that is favourable for corn is not favourable for oats, and, vice versa. Cutworms, crows or other agencies may destroy one crop and not another. The time for seeding and ensiling the different crops occurs at different seasons thus spreading the work involved over a longer period. Three different crops, oats, corn and sunflowers are grown at the Experimental Station in order that unforeseen climatic and soil conditions will be met and overcome. Any farm supporting a maximum number of live stock should not run the risk involved in a one crop silage production program.

Observations indicate that the silo is neither as popular nor as extensively used as it once was by beef cattle breeders or the farmer who is carrying live stock as a side line to grain growing. The silo is more than holding its own, however, on dairy farms where feed production is the major problem, particularly dairy farms catering to a city milk trade. Silo filling conflicts with harvesting and threshing operations on the ordinary farm and, for that reason, its use has been largely replaced by the self feeder where dry fodder is run through an ensilage cutter, or one of the numerous types of feed grinders, after the harvesting and threshing season is over and during the feeding season.

The types of silos used most extensively are the trench and upright silos. The trench silo is economical in cost of construction and, because it does not freeze badly, is very useful for winter feeding. The upright type of silo is best for fall, spring and summer feeding as the surface exposed is less than in the case of the trench silo, consequently there is much less spoilage in the warmer weather.

The Experimental Station, Lacombe, has tested the stack method of making silage but found that the proportion of feed spoiled was so high that the benefits resulting from ensiling the crop did not compensate for the heavy loss. The sheaves were spoiled to a depth of one foot over the entire surface of the stack while mould extended inwards to the bands of the sheaves around the outside of the stack resulting in a complete loss of the whole sheaf. Approximately one-third of the feed was lost in making silage by this method which seems too high to justify its use.

SUNFLOWERS

Sunflowers are the most dependable of the different silage crops from the standpoint of yield per acre. They will stand approximately eight degrees of frost without injury, considerably more than corn, but unfortunately when once frozen are worthless. Sunflowers when frozen in the immature stage turn brown and decay so quickly that they are without value for the production of either silage or dry fodder. To make matters worse, the weight of the heads usually

causes the stalk to break about one-third of the way from the top with the result that it is practically impossible to harvest a frozen sunflower crop with either a grain or a corn binder. The practice followed at the Lacombe Station is to harvest the sunflowers before a killing frost which usually occurs around September 10.

Sunflowers produce silage that, while excellent, is less nutritious and less palatable than either corn or oats silage. On the other hand, those carrying a maximum herd of cattle should have at least one-third their silage crop consist of sunflowers because the crop can be depended upon to produce a reasonably large tonnage per acre even under the most adverse conditions.

Sunflowers are usually seeded about May 15 in rows thirty inches apart, spacing the seeds in the row at the rate of three to four per foot, which requires from 10 to 15 pounds of seed per acre. While this will provide a thick stand, it is only sufficiently thick to permit harrowing the crop as it comes up, thus reducing the tillage necessary to keep the crop free from weeds; it also gives stalks that are both shorter and finer and much easier to handle in the field and at the cutting box. Sunflowers cut while immature should be allowed to wilt two or three days after cutting before ensiling and thus avoid serious drainage losses from the silo. Varieties of the Mammoth or Giant Russian type are most dependable.

No. 28—Upright type of stave silos in use at the Experimental Station, Lacombe. Silage freezes badly in this type of silo but they are better than other types for spring, summer and fall feeding.

No. 29—Digging a trench silo at the Experimental Station, Lacombe. Silage does not freeze badly in this type of silo.

No. 30—A stack silo. This stack contained 30 tons of green oat bundles, and was sixteen feet across and about fifteen feet high when first built.

No. 31—Oats for silage. A crop such as this will yield eight to ten tons per acre and is the best and cheapest silage grown at the Lacombe Station. Unfortunately, oats will not yield well in dry seasons.

No. 32—Sunflowers, yielding twelve to sixteen tons per acre, can be depended on to give a larger tonnage per acre than any other crop.

No. 33—A damaged stand of corn interseeded with oats produces several tons per acre of forage which may be used as dry fodder or for silage.

No. 34—Cultivating a good stand of sunflowers. Seeding rather thickly reduces the height so that the sheaves are more easily handled in the field and at the cutting box and does not materially reduce the yields.

No. 35—Corn gives a fair yield and tends to improve in both quality and yield as better strains are introduced.

No. 36—A sunflower stand which was damaged by cutworms and interseeded with oats gave an excellent yield of a superior silage crop which can be harvested with a grain binder.

CORN

Corn is the least dependable of the three silage crops grown. It makes a very poor growth in a cold, wet season and is very susceptible to frost injury. On the other hand, a light touch of frost appears to improve immature corn for silage purposes, and corn which has been slightly frozen in the field does not break down as do sunflowers.

The varieties of corn used at the Lacombe Station are Gehu and Northwestern Dent. They are sown in drills thirty inches apart at the rate of about

15 pounds per acre. Since corn seldom attains the glazed stage of maturity recommended as the proper stage at which to ensile corn, it is usually harvested after the first frost, about the first week of September.

The silage produced from corn grown in Central Alberta is usually acid and about midway between sunflowers and oats in quality. Yields range from five to twelve tons per acre depending on the season, etc. There appears to be a gradual improvement in both the yield and quality of silage produced which may be explained by the fact that the crop is becoming better acclimatized and, in addition, plant breeders are continually evolving new strains which are more suited to the needs of this district.

OATS

The best silage produced at the Lacombe Station is made from oats harvested in the firm dough stage of maturity. Providing a suitable variety is used and a reasonable amount of rainfall occurs, oats will yield from 5 to 8 tons per acre at a lower cost per ton than any other silage crop. Unfortunately however, oats are very unproductive in a dry year when feed is most needed, hence the necessity of growing other silage crops.

Oats for silage are grown as though for an ordinary grain crop except that they are usually seeded late as for green-feed. Since yield per acre is the major consideration in selecting varieties for this purpose, it is doubtful if a better variety than Banner could be used.

Oats for silage constitute one of the best cleaning crops used at the Lacombe Station. Late seeding makes it possible to partially summer-fallow the land before seeding. If the land is partially fallowed before seeding the oats, they will germinate quickly and make a rapid, vigorous growth, somthering most of the weeds which may germinate along with them. Since they are harvested while still immature and ensiled immediately, any weeds which develop along with the crop are ensiled before they ripen seeds.

The relative average production of the three silage crops is somewhat as follows: oats, six tons; corn, seven tons and sunflowers, twelve tons per acre.

MISCELLANEOUS SILAGE CROPS

Any immature or green cereal or grass will make useful silage. Grain polluted with weeds such as pigweed, wild oats, etc., has been harvested and ensiled at the Lacombe Station, thus converting what would have been a serious weed contamination into an excellent feed. Stands of corn and sunflowers seriously reduced by cutworms and blowing have been interseeded with oats and the resulting mixed crop ensiled. There appears to be no limitations to the use of the silo in caring for miscellaneous weedy fodder or grain crops which might otherwise be a complete loss.

Mixtures of equal parts by measure of oats and corn as well as oats and sunflowers have been sown both in drills thirty inches apart as an intertilled crop and as an ordinary green feed crop, and have produced silages superior to that made from pure corn or sunflowers. Growing corn and sunflowers in a mixture with oats has advantages over growing corn and sunflowers alone in that the quality of the silage is improved, the crop is easily harvested with the ordinary grain binder and is much easier handled both in the field and at the cutting box. In addition, the oats tend to keep the weeds in check in a carelessly cared for crop of corn or sunflowers, and, by reducing the size of the plants,

make it possible to use the crop to advantage as dry fodder if necessary. The disadvantages of the crop are that the yield is reduced and the land is not left in as good condition as is the case where corn or sunflowers are grown in rows and kept clean.

The fact that silage crops can be harvested in wet weather while most forage crops must be dry when harvested gives silage crops a distinct advantage over other forage crops in many seasons.

ROOT CROPS

Approximately five acres of roots are grown each year at the Lacombe Station in addition to those included in the regular variety tests. While fair success is usually met with in the variety test plots, the general field crop usually meets with unforseen conditions which indicate that the production of roots under field conditions is a rather hazardous undertaking. Mangolds (mangels) are more difficult to grow than swede turnips. The stand of mangolds has been ruined by late spring frosts, soil drifting, cut-worm or biting insects during seven of the last ten years' tests. Swede turnips were less subject to injury from these sources but frequently had the yields seriously reduced by maggots which feed on the growing roots. Carrots usually grow well and produce excellent yields.

It is doubtful if roots will enter into the forage crop scheme on the general farm for some years yet for the reason that the crop is not particularly safe from the production standpoint and the average western farmer and farm hand does not take kindly to work he cannot do with machinery.

FORAGE CROP DISPOSAL

Many grain growers hesitate to undertake diversified farming for the reason that there is no established market for many of the forage crops other than that available by the live stock route. They are afraid that the chores involved in live stock production may tie them down so closely that sufficient time will not be available for interests and pleasures to which they hitherto become accustomed as grain growers.

Modern methods and machinery have taken much of the drudgery out of live stock production as well as grain growing. The self feeder as used in the live stock industry has been perfected to the point where the animal is fed more economically and in such a way that they do better than if fed by hand by an indifferent stockman. All the attention these self feeders require when once filled is that they be looked at each day to see that the feed is working down into the feed troughs properly. The frequency of filling will vary from a week to three months depending on the kind of feed being fed and the size of the feeder.

Many farmers using large numbers of work horses never stable them. Their hay or other roughages are fed from large feed racks which hold two or three tons. The grain is fed in large portable feed troughs. The horses during the winter and idle season have free access to the self feeder and a pasture field in summer with the addition of a straw stack for feed and shelter during the winter.

Feed racks for hay and straw have been in use for cattle for years. The new type of self feeder, however, is one in which cut feed is available to the live stock at all times, and is constructed large enough to hold two or three months'

No. 37—Self feeder in use at A. Gilmour's, Lacombe. The cattle have free access to cut feed in the self feeder and uncut straw at the end of the feeder. They eat the straw through the protecting fence which keeps them from wasting it.

No. 38—The other end of the self feeder shown in No. 37. The small feed bin contains chop which is fed with a pail once daily in the feed trough of the feeder.

No. 39—A self feeder for sheep in use at A. Gilmour's, Lacombe. It will hold two or three loads of hay and is accessible to several hundred feeder lambs. Note the absence of waste feed.

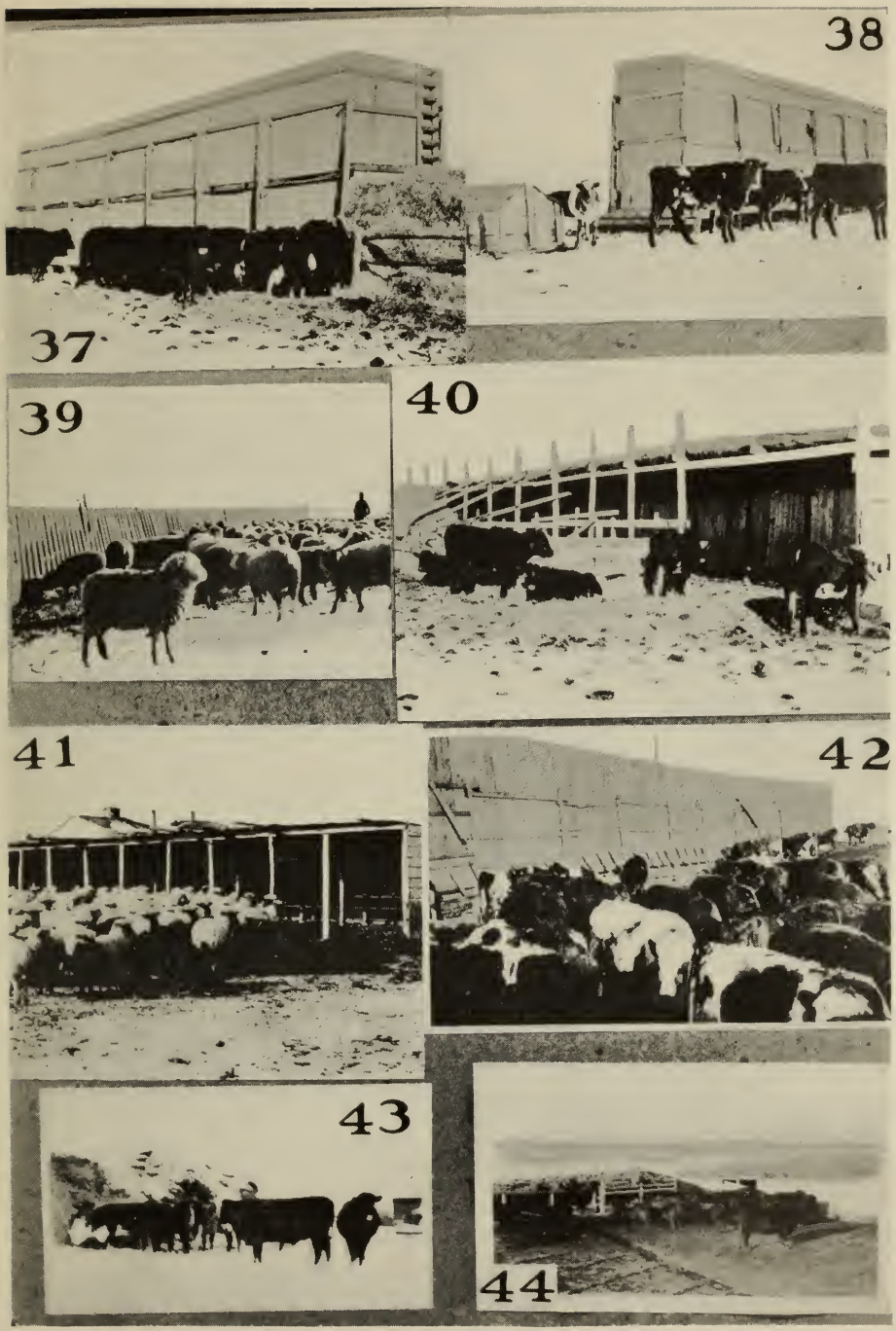
No. 40—Expensive shelter is not necessary. Yearlings being carried over the winter at a minimum cost at A. Gilmour's, Lacombe. These cattle have access to self feeder as shown in No. 37. Note the bedding supplied these cattle. A similar shed is provided for cattle shown in No. 42.

No. 41—Cheap but efficient winter protection provided for feeder lambs at A. Gilmour's, Lacombe. No big overhead is necessary for winter feeding either cattle or sheep.

No. 42—Well finished cattle on self feeders at McKenzie Bros., Lacombe. These cattle have free access to the self feeder which is filled with cut feed and chop mixed together at the one operation of filling the self-feeder.

No. 43—The first self feeders used in the West. Straw stacks provide both feed and shelter. A stack of good straw and an abundant supply of slightly warmed water will winter live stock at a minimum expense.

No. 44—Aberdeen-Angus cattle in winter quarters at the Experimental Station. These cattle have access to hay and straw in the feeding racks at the left and are protected by the cheap straw roofed shelter at the right. Note the absence of chores necessary in caring for live stock in this way. The self feeders shown in these pictures have all been in use for several years and have reduced chores to a minimum and eliminated the necessity of always being "tied to a cow's tail" when caring for live stock.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feed. Dry fodder in the form of straw, hay, greenfed, etc., is run through an ensilage cutter or feed mill and is available at all times to the animals. The day's grain allowance is fed in the feeding trough of the feeder once a day. The newer types of feed grinders and mixers such as the Letz and the hammer type machines make it possible to mix the grain and dry forage to-gether when they are being ground. Both methods have their advocates. The advisability of their use will depend to a large extent on the kind of cattle being fed and the fodder used.

That the self feeder for cattle is a success from the financial and practical standpoint has been amply demonstrated for several years by live stock drovers of the Lacombe district who buy both the feed and the cattle. A number of purebred live stock breeders of the Lacombe district finish the cattle they are fitting for sale on self feeders. They claim they can get greater gains and a better finish on their cattle when they have free access to a self feeder filled with cut feed mixed with ground grain than if fed by hand in the usual way.

Feeding cattle with a self feeder requires very little overhead in the way of buildings. The feeder is situated in such a way that it is protected from the wind by a bluff or a board fence around the feeding yard. Some feeders claim that an open shed constructed with a roof of poles and straw is all that is necessary for the comfort of the cattle. Others maintain that such protection is not essential.

Sheep will keep their wool cleaner and thrive better if fed their hay from a properly constructed feed rack which can be made large enough to hold several days' feed without refilling.

Much might be said in connection with the self feeder for live stock. The points to keep in mind are that self feeders are beyound the experimental stage; that they have been perfected to the point where all the attention they require is to be checked over each day to see that the feed has not clogged so that it cannot move down into the feeding trough; and that they will relieve the farmer of much of the tiresome routine chores once considered an unavoidable part of live stock production.

APPENDIX

It is not the intention of the writer to minimize the importance of grain growing as a cash crop for the park belt, but rather to assist by the use of better and cheaper pasture and fodder crops in producing more cheaply, and of better quality the live stock necessary for the proper utilization of the cheap, low grade grain and the low priced by-products of grain growing.

It is impossible to completely cover the question of forage crop production in a summary such as that given herewith where only the salient points are discussed. Undoubtedly there will be many points on which the reader will wish further information. It is suggested that this information be obtained from the nearest Experimental Station, University, School of Agriculture or Agricultural Agent.

ACKNOWLEDGMENT

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PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
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